Having described a preferred embodiment of the invention, the following is claimed:

1. A method for bonding cathode components of an x-ray tube together, the method comprising:

providing a support arm comprising a first metal;

providing a ceramic insulator having a first metalized surface;

assembling a sandwich structure including the support arm and ceramic insulator by placing a first member of filler material between the support arm and the first metalized surface of the ceramic insulator, the first member of filler material comprises at least a second metal wherein a first alloy system comprising the first and second metals includes an alloy minimum point percentage composition of the first and second metals having a first alloy system minimum melting point for the alloy minimum point percentage composition that is lower than both of the melting point of the first metal and second metal;

heating the assembled sandwich structure causing diffusion between the first metal and second metal thereby forming a varying percentage composition of the first and second metals of the first alloy system across a bonding region, the bonding region having at least one diffusion layer having the alloy minimum point percentage composition of the first and second metals, the heating of the assembled sandwich structure continuing to a bonding temperature of at least the first alloy system minimum melting point and holding the sandwich structure at the bonding temperature for a desired period of time to melt a desired portion of the bonding region comprising at least the alloy minimum point percentage composition of the first and second metals; and

allowing the assembled sandwich structure to cool to a steady state temperature below first alloy system minimum melting point temperature.

2. The method of claim 1 wherein the bonding temperature is above the first alloy minimum melting point and is below both of the melting point of the first metal and second metal.

3. The method of claim 1 wherein the member of filler material includes a third

metal different from the first and second metals and the second metal is plated on opposite sides of the third metal.

4. The method of claim 3 wherein the second and third metal are diffusible to form a second alloy system different than the first alloy system and the second alloy system includes an alloy minimum point percentage composition of the second and third metals having a second alloy system minimum melting point for the alloy minimum point percentage composition that is lower than both of the melting point of the third metal and second metal.

5. The method of claim 4 wherein the bonding temperature is at least the melting point for at least one of the first alloy system minimum melting point and the second alloy system minimum melting point.

6. The method of claim 3 wherein the first metal is nickel.

7. The method of claim 6 wherein the second metal is gold and the third metal is copper.

8. The method of claim 1 wherein the metalized layer of the ceramic comprises nickel.

9. The method of claim 1 wherein the ceramic insulator has an opposite facing second metallized surface and the first and second metalized surfaces comprise a desired amount of the first metal.

10. The method of claim 9 comprising placing a second member of filler material comprising the at least a second metal between the second metallized surface of the ceramic insulator and at least one cathode cup component comprising the first metal.

11. The method of claim 2 wherein the bonding temperature is approximately the minimum melting point of the alloy system.

12. An x-ray tube cathode assembly comprising:

a support arm comprising a first metal;

a ceramic insulator having a first metalized surface wherein the metalized surfaces comprise a desired amount of the first metal;

a first member of filler material in contact with the support arm and the first metalized surface of the ceramic insulator, the first member of filler material comprising at least a second metal wherein a first alloy system comprising the first and second metals includes an alloy minimum point percentage composition of the first and second metals having a first alloy system minimum melting point for the alloy minimum point percentage composition that is lower than both of the melting point of the first metal and second metal;

a bonding region resulting from heating the cathode assembly causing diffusion bonding to proceed, the bonding region having a layer of alloy comprising the minimum point percentage composition, the heating of the cathode assembly continuing to a bonding temperature of at least the first alloy system minimum melting point and holding at that temperature for a desired period of time.

13. The x-ray tube cathode assembly of claim 12 wherein the bonding temperature is above the first alloy minimum melting point and is below both of the melting point of the first metal and second metal.

14. The x-ray tube cathode assembly of claim 12 wherein the member of filler material includes a third metal different from the first and second metals and the second metal is plated on opposite sides of the third metal.

15. The x-ray tube cathode assembly of claim 14 wherein the second and third metal are diffusible to form a second alloy system different than the first alloy system and the second alloy system includes an alloy minimum point percentage composition of the second and third metals having a second alloy system minimum melting point for the alloy minimum point percentage composition that is lower than both of the melting point of the third metal and second metal.

16. The x-ray tube cathode assembly of claim 15 wherein the bonding temperature is at least the melting point for at least one of the first alloy system minimum melting point and the second alloy system minimum melting point.

17. The x-ray tube cathode assembly of claim 14 wherein the first metal is nickel.

18. The x-ray tube cathode assembly of claim 17 wherein the second metal is

gold and the third metal is copper.

19. The x-ray tube cathode assembly of claim 12 wherein the metalized layer of the ceramic comprises nickel.

20. The x-ray tube cathode assembly of claim 12 wherein the ceramic insulator has an opposite facing second metallized surface and the first and second metalized surfaces comprise a desired amount of the first metal.

21. The x-ray tube cathode assembly of claim 20 comprising placing a second member of filler material comprising the at least a second metal between the second metallized surface of the ceramic insulator and at least one cathode cup component comprising the first metal.

22. The x-ray tube cathode assembly of claim 13 wherein the bonding temperature is approximately the minimum melting point of the alloy system.

23. An x-ray tube cathode assembly comprising:

a support arm comprising a sufficient amount of a first metal for diffusion bonding with a different second metal to form a first alloy system;

a ceramic insulator having a first metallized surface; and

means for securing the support arm to the ceramic insulator, the means for securing comprising a metal sheet comprising a third metal, the metal sheet plated on each side with the second metal, the third metal a different metal than either of the first and second metals, the means for securing disposed at an interface between a first surface of the support arm and the first metallized surface of the ceramic insulator, wherein a portion of the first alloy system including a percentage composition of the first and second metals that has a minimum melting point that is lower than both of the melting point of the first metal and second metal.

24. The x-ray tube cathode assembly of claim 23 wherein the second and third metal are diffusible to form a second alloy system different than the first alloy system and the second alloy system includes an alloy minimum point percentage composition of the second and third metals having a second alloy system minimum melting point for the alloy minimum point percentage composition that is lower than both of the melting point of the third metal and second metal.

25. The x-ray tube cathode assembly of claim 23 wherein the first metal is nickel.

26. The x-ray tube cathode assembly of claim 23 wherein the second metal is gold and the third metal is copper.

27. The x-ray tube cathode assembly of claim 23 wherein the metalized layer of the ceramic comprises nickel.

28. An X-ray tube comprising:

an evacuated envelope;

an anode assembly located within the evacuated envelope; and

a cathode assembly located within the envelope in operative relationship to the anode assemble, the cathode assembly comprising:

a support arm comprising a sufficient amount of a first metal for diffusion bonding with a different second metal;

a ceramic insulator having a first metallized surface and an opposite facing second metallized surface; and

means for securing the support arm to the ceramic insulator, the means for securing comprising a metal sheet comprising a third metal, the metal sheet plated on each side with the second metal, the third metal a different metal than either of the first and second metals, the means for securing disposed at an interface between a first surface of the support arm and the first metallized surface of the ceramic insulator, wherein a portion of an alloy including the first and second metal comprises a percentage composition of the first and second metals that has a minimum melting point for the percentage composition that is lower than both of the melting point of the first metal and second metal.

29. The X-ray tube of claim 28 wherein the second and third metal are diffusible to form a second alloy system different than the first alloy system and the second alloy system includes an alloy minimum point percentage composition of the second and third metals having a second alloy system minimum melting point for the alloy minimum point percentage composition that is lower than both of the

melting point of the third metal and second metal.

30. The X-ray tube of claim 28 wherein the first metal is nickel.

31. The X-ray tube of claim 28 wherein the second metal is gold and the third metal is copper.

32. The X-ray tube of claim 28 wherein the metalized layer of the ceramic comprises nickel.

33. The X-ray tube of claim 28 wherein the first and second metalized surfaces of the ceramic insulator comprise a desired amount of the first metal.

34. The X-ray tube of claim 28 comprising a second means for securing between the second metallized surface of the ceramic insulator and at least one cathode cup.